

Exhibit 9

to

**UNITED STATES' CONSOLIDATED OPPOSITION TO
DEFENDANTS' MOTIONS TO EXCLUDE EXPERT OPINIONS**

Production and Interpretation of Aerial Photographs and Maps Covering the Hudson Refinery Superfund Site in Cushing, OK

**In the matter of
United States of America v. Land O' Lakes, Inc. et al.**

**Case No. 5:16-CV-00170-PRW
U.S. District Court, Western District of Oklahoma**

**Prepared for:
Stinson LLP
and
Ryan Whaley Coldiron Jantzen Peters & Webber**



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1.0 Introduction

Aero-Data Corporation was engaged by Ryan Whaley Coldiron Jantzen Peters & Webber PLLC and Stinson LLP to perform a historical aerial photography study of an area in Cushing, Oklahoma known as the Hudson Refinery Superfund Site (Site). I was asked to identify, acquire, and produce aerial photography from early years through the present and produce imagery for viewing and analysis.

1.1 Statement of Qualifications

My name is Randall W. Grip. I have a Bachelor of Science Degree in Geography from Louisiana State University. I am vice-president of Aero-Data Corporation. Aero-Data specializes in aerial mapping and environmental studies using aerial photography and historical maps. Over the past 20 years, I have provided expert photo-interpretation and photogrammetry services for environmental assessment purposes. In the course of this work, I have participated in studies and obtained and interpreted aerial photographs of sites throughout the United States as well as in other nations.

My expertise is in the area of review and analysis of readily available aerial photography. The processes I use include research and acquisition of stereoscopic photography, high resolution photogrammetric scanning, geo-registration of stereo images, and digital orthophoto production. I have been qualified as an expert witness in the fields of photo-interpretation and photogrammetry.

Aero-Data's client list includes many major corporations as well as government agencies such as the U.S. Department of Justice, the Louisiana Department of Natural Resources, and the Louisiana Department of Environmental Quality.

1.2 Information Considered in Forming Opinions

My opinions are based upon review and analysis of vertical stereoscopic and monoscopic aerial photography, oblique and ground photography, maps, and reports of the Site as well as my experience and training. Attachment A is a listing of the aerial photography, documents, and other information I have considered in forming my opinions.

1.3 Production of Geo-Registered Images

Historical aerial photography was acquired of the Site from public and private sources. The historical aerial photography was then registered to a common coordinate system and reviewed using digital photogrammetric workstations.

Some maps and exhibits were also geo-referenced to the aerial photography using ArcGIS. The aerial imagery, as well as the geo-referenced maps, are included in Attachment B.

I reserve the right to supplement this report if additional documents or material become available.

1.4 Area of Expertise in Which I Expect To Testify

I expect to testify in the areas of photointerpretation and photogrammetry. Photointerpretation is the science of identifying objects in photography and determining their meaning. Photogrammetry is defined as the science of taking measurements from photography. In practical terms,

photogrammetry is the science of making maps. My interpretations and opinions outlined in this report are based on scientific and technical interpretations of the available photography and my specialized knowledge in this field. Attachment C is my current resume, and Attachment D is a listing of my Trial Testimony, Deposition Testimony, and Publications. My billing rate is \$150 per hour for mapping, report production, and testimony.

2.0 Methods and Materials

The following text provides a description of the methods used to acquire, geo-reference and interpret the aerial photography in this report.

2.1 Aerial Research and Acquisition

The historical aerial photography study of the Site began with research for available photo coverage from public and private vendors. The photo coverage was then obtained in the form of frames consisting of vertical stereoscopic photography in a 9"x9" format and/or orthophotos. The catalog of images over time are taken at various altitudes and scales which affects the resolution or clarity of each image.

2.2 Setting Up the Stereomodels

Two or more raster images for each stereo date of photography were then imported into a digital stereoplotter capable of providing stereoscopic viewing of the images at magnification levels ranging from 1x to 128x. The digital stereoplotter also allows precise mapping of significant environmental features, which are interpreted, in the 3-D imagery.

Ground control (State Plane OK-North Zone NAD83 USFEET) for the initial stereomodel, was derived from the USGS Digital Quarter Quads (DOQQs) and quadrangle maps (1:24,000 scale DRGs) of the area. Distant mapped features, thousands of feet off the Site but which were also visible in the aerial photography, were measured (coordinates derived) from the USGS DOQQs and used as ground control points. I have superimposed the Site with a polygon over recent USGS 7.5' minute quadrangle maps. I have also superimposed the control points (X, Y and Z) used to geo-reference the initial stereo model. The control points are plotted on a USGS topographical quadrangle map and 1995 aerial photograph in Attachment B hereto.

The coordinates of each selected visible ground control point were then entered into a control point file in the digital stereoplotter. The floating dot (measuring point) of the stereoplotter was carefully positioned by the operator with the hand controller, one point at a time, onto each of the visible control points and the coordinates of that point (from the ground control point file) were assigned to the image. When sufficient control points had been visited, accepted and the model checked for residual errors, the stereo model was then confirmed to be level, scaled and locked into the coordinate system. As a result, accurate measurements of heights and distances could now be made within the stereo model area by using the digital stereoplotter.

Other stereo models for additional photomissions were then set up using ground control points derived from the initial stereo model. This assured that the stereo models for all dates were very accurately registered one to another in the same coordinate system.

2.3 Digital Ortho Production

Next, using the stereomodels and digital stereoplotter, a digital orthophoto was produced for each date of photography. A digital orthophoto is a two dimensional raster image produced from one or more frames of vertical aerial photography such that most of the distortion caused by terrain displacement and tip and tilt in the mapping camera has been removed, and the resulting raster image is accurately registered to a chosen coordinate system. As a result, each digital orthophoto accurately depicts the roads and other significant features located within the Site in their true geographic position.

Digital orthophotos are widely accepted today by both government and industry as an improvement over the base maps and photomosaics previously used to show the locations of features within a geographic area. Digital orthophotos have the accuracy of a stereoplotter or land survey produced map with the resolution of a photograph.

2.4 Photointerpretation

Photointerpretation of the Site was conducted on the digital stereoplotter using the same digital stereomodels used to produce the digital orthophotos. The digital stereoplotter allows me to view the Site in 3-D on a stereo computer monitor or large computer projection screen, normally at magnification factors ranging from 8X to 32X while identifying and mapping the outlines of significant environmental features. I am able to review the activities with the refinery units, such as tanks, ponds, pits, and trenches. Because I am viewing the images stereoscopically (in 3-D) and in a coordinate system, I am able to determine the drainage flow direction and surface flow based on the topography.

When necessary to map very small features, I could zoom to magnification factors as high as 128X. Generally speaking, zoom settings greater than 32X do not yield more detail, but they do help in carefully mapping small features.

2.5 Geographic Information Systems

The digital orthophotos were imported into the geographic information system (GIS).

The images and registered maps contain specific information which must be viewed by the reader in order to fully understand this report. They are included in Attachment B and constitute the primary source of information in this report. They were prepared so that they may be displayed using computer generated prints or a computer projection system. The GIS provides a wide range of capabilities such as zooming, turning themes (layers) on and off and measuring distances. The images and maps will be used as exhibits at trial in my testimony. There may be additional demonstrative exhibits used at trial as well.

I reserve the right to revise and supplement this report.

3.0 Historical Aerial Photography

The following observations reference the labels and mapping included on the images in Attachment B. These images should be reviewed while reading this report.

3.1 Rebuttal Comments/Findings

I was asked to review and evaluate the findings/opinions of Mary Sitton's report on behalf of DOJ in which she interpreted and mapped features on the Site. My evaluation and findings/opinions of Ms. Sitton's report are as follows:

Ms. Sitton interprets "Probably Oily Liquid" throughout her report. My response is that these areas that may simply be standing precipitation with no turbidity within bermed areas that are designed to hold liquid.

Ms. Sitton also interprets "Staining/Liquid" several times in her report.

My response to these classifications is:

- It is difficult to determine the composition of any liquid using black and white photography alone. To definitively identify an oily area using aerial photography requires more than simply noting an area's appearance. An oily area can be identified using high resolution color imagery; for instance, a sheen can be detected on the surface of a waterbody. This is not possible with black and white imagery that is relied upon by Ms. Sitton.
- After reviewing the same imagery as Ms. Sitton, it is my opinion that some of the areas Ms. Sitton identifies as "Staining" are simply wet areas.
- Neither Ms. Sitton nor I can determine the type of liquid causing a wet or dark surface from the black and white imagery alone.

The following are portions of Ms. Sitton's report in *italics* and my rebuttal comments follow.

4/2/1938 South Refinery

On page 7, paragraph 5, Ms. Sitton wrote: "*Probable oily liquid and material were within the Tank 36 Berm.*"

Rebuttal comments - The liquid in the berm is medium to dark in tone. However, sun glint is visible and the tone of the area is very similar to a wet area west of the refinery in an adjacent residential area with no oil refinery activity. Identification of oil in this area cannot be determined as "probable".

5/10/1949 South Refinery

On page 8, paragraph 3, Ms. Sitton wrote: *"A pond with probable oily liquid (the future Coke Pond) and another pond were south of Tank 35."*

Rebuttal comments – The liquid in (the future Coke Pond) is dark in tone but nearly identical in tone to the impounded area in the undeveloped North Refinery well away from any refinery activity. No slick or floating product is visible in the aerial photography. A determination of "probable oily liquid" is not supportable.

4/19/1963 North Refinery

Beginning on page 8, paragraph 6, Ms. Sitton wrote: *"A trench with dark-toned material and debris was southeast of the Wastewater Ponds."*

Rebuttal comments - A rectangular object approximately 6x24 feet in dimension is visible in what appears to be a lay down yard.

4/19/1963 South Refinery

On page 9, paragraph 2, Ms. Sitton wrote: *"Probable oily liquid was in the Tank 36 Berm, to the northeast of the berm, and in the pond to the east."*

Rebuttal comments – Ms. Sitton has labeled "Probable Oily Liquid" on the majority of the liquid surfaces in this area and areas to the south and east, regardless of whether they are dark or medium toned. The liquid within the containment of the Tank 36 berm is dark in tone but no oil slick or floating product is visible in the aerial photography. The liquid in the pond to the east is slightly lighter in tone. There are ponds off of the Site on this date with both dark and medium toned liquid and appear to have no association with refinery activities.

On page 9, paragraph 2, Ms. Sitton wrote: *"Horizontal tanks and staining were southeast of Tank 91."*

Rebuttal comments – The "staining" identified by Ms. Sitton is impossible to differentiate from standing liquid in a low area.

10/1/1966 North Refinery

On page 9, paragraph 3, Ms. Sitton wrote: *"Liquid was west and southwest of the Wastewater Ponds. The liquid was flowing down gradient in the area where liquid and staining were visible in 1963."*

Rebuttal comments – The "liquid" identified is within a drainage pathway first visible in the 7/13/1956 imagery and possibly precipitation related.

10/1/1966 South Refinery

On page 9, paragraph 4, Ms. Sitton wrote: *"Probable oily liquid was in the Tank 36 Berm, to the northeast of the berm, in the pond to the east, and in the ponds west of Tanks 96 and 97."*

Rebuttal comments – There is a possible oil slick line visible within the bermed area west of Tank 97. The other liquids just appear dark.

On page 9, paragraph 4, Ms. Sitton wrote: *"A pond with probable oily liquid was north of Tank 27."*

Rebuttal comments – The liquid north of Tank 27 is dark in tone but no oil slick or floating product is visible in the aerial photography.

11/30/1969 North Refinery

On page 10, paragraph 1, Ms. Sitton wrote: *"Liquid located between Tanks 47 and 55 and liquid from the Tetraethyl Lead ("TEL") Building was flowing northeast toward Skull Creek."*

Rebuttal comments – Liquid flow features are visible, but it is unclear that the liquid originates at the building.

11/30/1969 South Refinery

On page 10, paragraph 2, Ms. Sitton wrote: *"Probable oily liquid was in the Tank 36 and Tank 23 Berms."*

Rebuttal comments – No oil slick or dark liquid is seen within the Tank 23 berm.

4/13/1979 South Refinery

On page 12, paragraph 1, Ms. Sitton wrote: *"Probable oily liquid and material was in the Tank 27 Berm."*

Rebuttal comments – No oil slick is seen within the Tank 27 berm and the tone is similar to the berm directly to the south which has no tank.

9/17/1980 North Refinery

On page 12, paragraph 3, Ms. Sitton wrote: *"Staining and probable oily liquid were on the Tank 104 Berm."*

Rebuttal comments – The area where Ms. Sitton is pointing is high up on the berm wall and is likely reflected sunlight on a dark plastic liner.

9/17/1980 South Refinery

On page 12, paragraph 4, Ms. Sitton wrote: *"Probable oily liquid and material were in the Tank 36 Berm, within the Runoff Pond west of Tank 96, and in the pond west of 97. Probable oily liquid was in the Tank 35 Berm and within the Coke Pond."*

Rebuttal comments – Dark liquid is visible within these areas, but it is not clear that they are oil.

On page 12, paragraph 4, Ms. Sitton wrote: *"Staining was adjacent to and north of the oil/water separator north of the Coke Pond and at the loading racks. Staining and liquid were in the Tank 38 Berm and south of Tank 36. Staining was in the Tank 63 and 64 Berms."*

Rebuttal comments – Medium toned to dark surfaces are visible within these areas, but it is not clear that they are oil.

3.2 Historical Aerial Photography Review

The following observations reference my labels and mapping included on the images in Attachment B.

To aid the reader, the Site will be discussed using two main areas, North Refinery and South Refinery, which are separated by W. Main Street. Both refinery areas have a north/south rail line visible on the eastern portion. An additional rail line is visible southwest to northeast within the South Refinery.

4/2/1938 National Archives

Ms. Sitton obtained and annotated this date of photography.

North Refinery

The North Refinery has not been developed. A single impoundment in a drainage pathway is holding liquid (precipitation). Impoundments are primarily drainage or low-lying areas that have been modified to hold liquid. Drainage pathways are visible on both sides of the rail line and mapped showing flow direction. Drainage has been mapped on selected dates in this report where the photo resolution is adequate or when there have been significant changes.

South Refinery

Tanks, tanks with berms, impoundments and ponds are visible on this date. Berms have been mapped on selected dates in this report where the photo resolution is adequate or when there have been significant changes. Ponds, for the purposes of this report, are primarily excavated areas designed to hold liquid. Drainage pathways are visible on both sides of the north/south rail line and mapped showing flow direction.

5/10/1949 National Archives

Ms. Sitton obtained and annotated this date of photography.

North Refinery

The North Refinery has not been developed, and the impoundment and drainage remains visible.

South Refinery

Tanks, tanks with berms, impoundments and ponds remain visible on this date. A new development with tanks and berms is visible on the northeastern portion. Additional bermed areas are visible north of the new tank development. On the southern portion, a berm opening is visible, and the area to the west appears dry. Liquid was visible in this area on the 1938 aerial.

3/25/1954 USGS

Ms. Sitton obtained but did not interpret or annotate this date of photography.

North Refinery

A new developed area with structures, tanks and bermed areas is visible since the 5/10/1949 date of photography.

South Refinery

A new tank and berm are visible for the first time in the northeastern portion. A pond was visible in this same area on the 5/10/1949 date.

11/19/1954 USGS

Ms. Sitton obtained but did not interpret or annotate this date of photography.

North Refinery

There are no significant changes since the previous date of photography.

South Refinery

There are no significant changes since the previous date of photography.

7/13/1956 FSA

Ms. Sitton obtained and annotated this date of photography.

North Refinery

The Impoundment is dry on this date of photography. A separator has been installed to the northwest of the tanks. A light toned disturbed area is also visible northwest of the tanks. This disturbance is likely due to construction activities of the flare which is first visible on this date.

South Refinery

There are no significant changes since the previous date of photography.

4/19/1963 FSA

Ms. Sitton obtained and annotated this date of photography.

North Refinery

The refinery has been expanded to the west and southwest since the previous date of photography. Steam from stacks in the approximate northern Process Area is visible and will remain visible on the majority of photo dates through 9/17/1980. Four tanks with berms are visible for the first time. An additional tank is visible for the first time north of the refinery. A flare pit with a flare visible in the center and trenches are visible northwest of the refinery.

Six rectangular-shaped ponds with berms and labeled Wastewater Pond 1-6 are visible for the first time. Surface flow features are visible on the western portion of the area. Drainage pathways have been mapped showing flow direction for this date. Road oiling is visible west and southwest of the series of Wastewater Ponds.

A new development is visible on the southeastern portion east of the rail line.

South Refinery

A separator is visible on the northern portion of the area southeast of Tank 35.

10/1/1966 Ace Aerial

Ms. Sitton obtained and annotated this date of photography.

North Refinery

Two new tanks are visible for the first time north of the existing tank area. The development on the southeastern portion has expanded to the north. Drainage pathways have been mapped showing flow direction for this date.

South Refinery

There are no significant changes since the previous date of photography.

11/30/1969 FSA

Ms. Sitton obtained and annotated this date of photography.

North Refinery

A small pond and trenches are visible southwest of the Wastewater Pond 1.

In the center of the area, trenches are visible south of the previously identified trenches. Drainage pathways have been mapped showing flow direction for this date. On the eastern portion of the area, a flow control structure and impounded liquid are visible for the first time in an area where the drainage pathways lead within the property boundary and before they travel offsite.

South Refinery

There are no significant changes since the previous date of photography.

12/28/1972 ODOT

Ms. Sitton obtained and annotated this date of photography.

North Refinery

Additional trenches are visible southwest of Wastewater Pond 1. A large area with a dark surface and dark mounded material are visible on the western portion of the area which appear to be indication of land farming activities. A bermed area with liquid is visible for the first time in the southwestern portion and labeled in future dates as "Firewater Pond 11." Road oiling is visible west and southwest of the series of Wastewater Ponds.

To the east of the rail line, drainage features and bermed areas have been constructed north of the previously visible flow control structure. A structure is visible for the first time with impounded

liquid to the west and a pond first visible to the east. A drain is first visible east of the structure to carry offsite.

South Refinery

A slick is visible in the pond. A separator is visible near the drainage features on the northern portion of the area east of the rail line.

12/7/1973 FSA

Ms. Sitton obtained but did not interpret or annotate this date of photography.

North Refinery

There are no significant changes since the previous date of photography.

South Refinery

There are no significant changes since the previous date of photography.

2/4/1974 USGS

Ms. Sitton obtained and annotated this date of photography.

North Refinery

Road oiling is visible west and southwest of the series of Wastewater Ponds.

South Refinery

There are no significant changes since the previous date of photography.

2/10/1974 USGS

Ms. Sitton did not obtain this date of photography.

Only partial coverage is available from this photomission and covers the tankage portions of the North Refinery.

North Refinery

There are no significant changes since the previous date of photography.

South Refinery

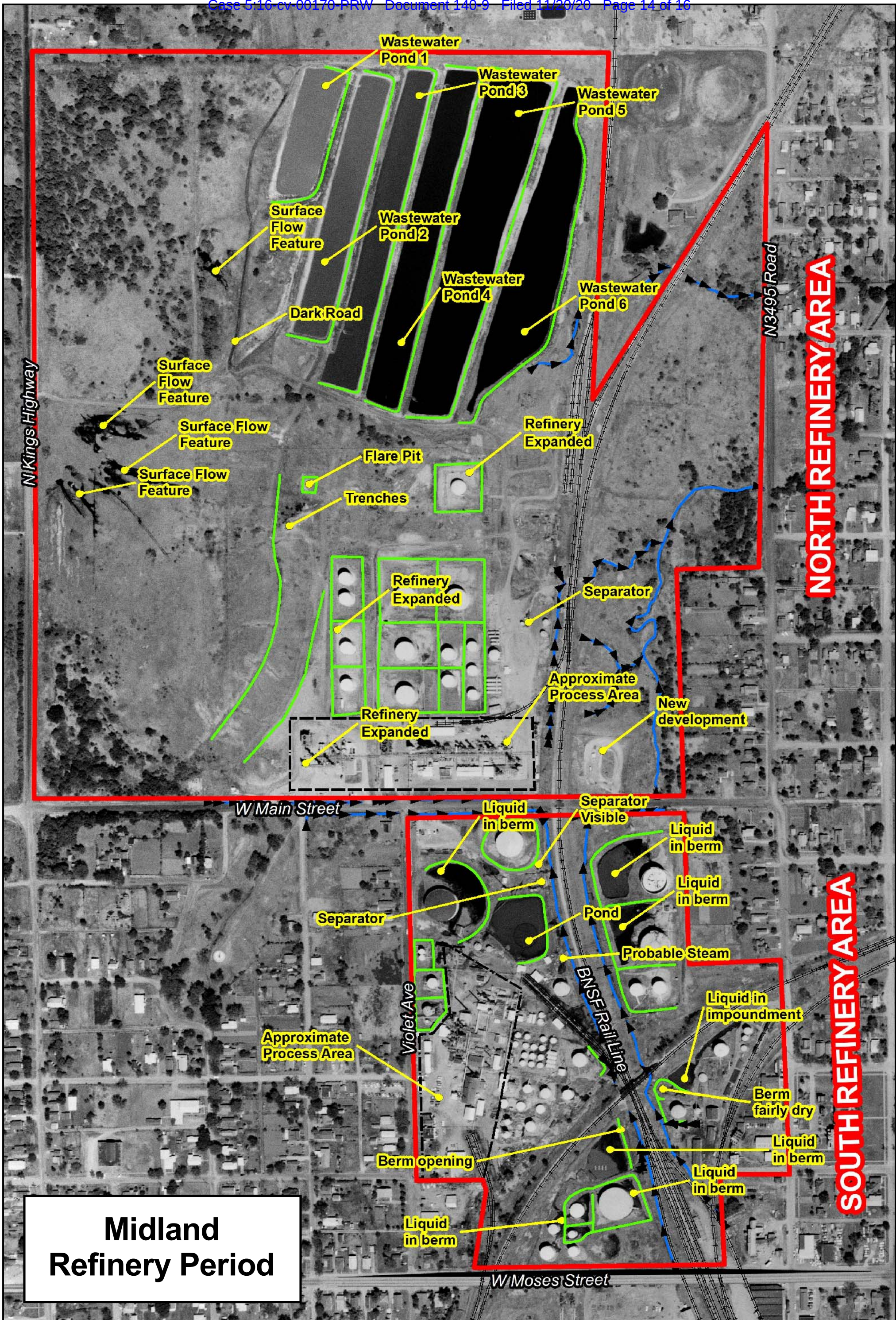
There are no significant changes since the previous date of photography.

4/13/1974 USGS

Ms. Sitton obtained but did not interpret or annotate this date of photography.

North Refinery

There are no significant changes since the previous date of photography.



Midland Refinery Period

4/19/1963

Photo Source: FSA

Legend

	Approximate Site Area		Drainage
	Notes		Tanks Removed
	Berms		Rail Line/Spur Approx.

0 300 Feet

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Midland Refinery Period

12/28/1972
Photo Source: ODOT

Legend

Approximate Site Area

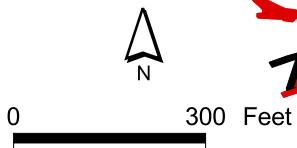
Notes

Berms

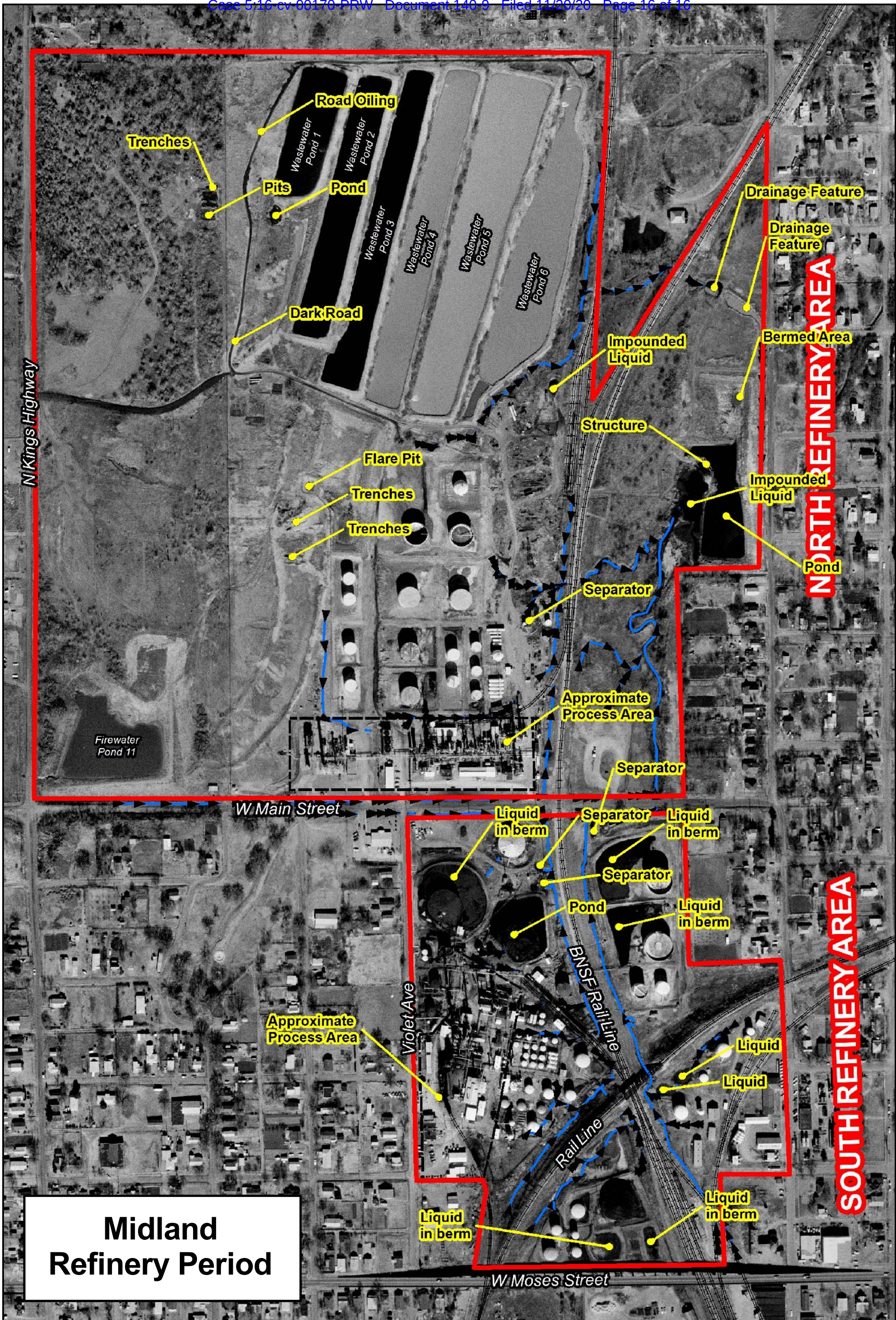
Drainage

Tanks Removed

Rail Line/Spur Approx.

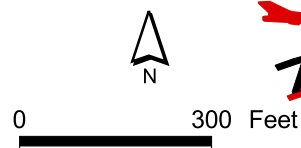


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2/4/1974
Photo Source: USGS

Legend			
	Approximate Site Area	▬	Drainage
●	Notes		Tanks Removed
▬	Berms	▬	Rail Line/Spur Approx.



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